(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 June 2004 (10.06.2004)

PCT

(10) International Publication Number
WO 2004/048716 A1

(51) International Patent Classification[7]: E04F 15/04, 15/02

(21) International Application Number: PCT/EP2003/013076

(22) International Filing Date: 19 November 2003 (19.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002/0682 25 November 2002 (25.11.2002) BE

(71) Applicant *(for all designated States except US)*: **FLOORING INDUSTRIES LTD.** [IE/IE]; West Block - IFSC., Dublin 1 (IE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **THIERS, Bernard, Paul, Joseph** [BE/BE]; Stationsstraat 134, B-8780 Oostrozebeke (BE). **CAPPELLE, Mark, Gaston, Maurits** [BE/BE]; Cardijnlaan 8, B-8840 Staden (BE).

(74) Agent: **DONNE, Eddy**; Bureau M.F.J. Bockstael nv., Arenbergstraat 13, B-2000 Antwerpen (BE).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE (utility model), DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

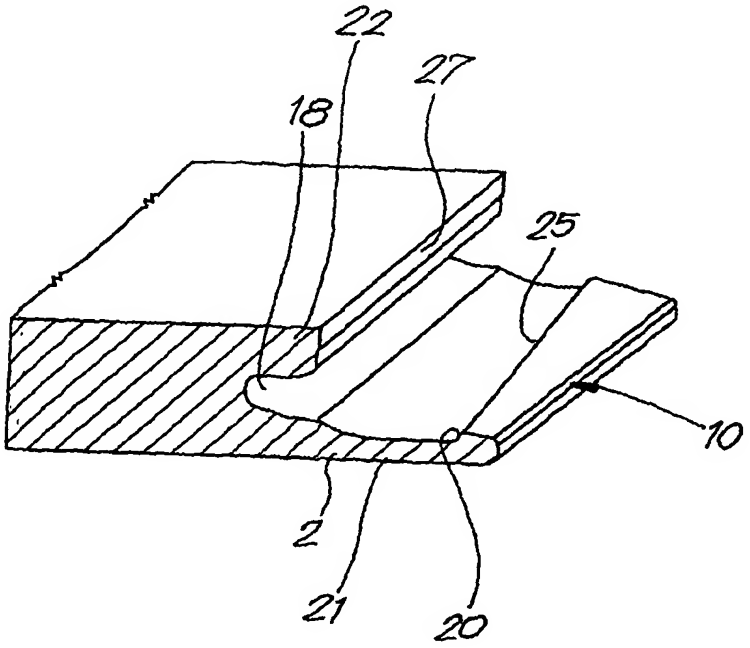
(84) Designated States *(regional)*: ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK,*

[Continued on next page]

(54) Title: FLOOR PANEL FOR FLOOR COVERINGS, PLACING AND MANUFACTURE THEREOF



(57) Abstract: Floor panel for forming a floor covering (1), which, at least at two opposite edges (5-6), is provided with coupling parts (9-10) which allow that two of such floor panels (2) can be coupled to each other, such that thereby a locking is obtained in a direction (D3) perpendicular to the plane of the floor panels (2), as well as in a direction (D4) in the plane of the floor panels (2) and perpendicular to the couple edges (5-6), whereby these coupling parts (9-10) in coupled condition allow for a mutual shifting (T) of the floor panels (2) over at least a well-defined length substantially in the longitudinal direction of said edges (5-6), characterized in that the floor panel (2) at said edges (5-6) is provided with integrated means (23) which bring the floor panels (2) during said shifting movement (T), as a consequence of this shifting movement (T), from a first condition (C1) into a second condition (C2), whereby the floor panels (2) in the second condition (C2) are coupled more tightly and/or closer to each other than the first condition (C1).

WO 2004/048716 A1

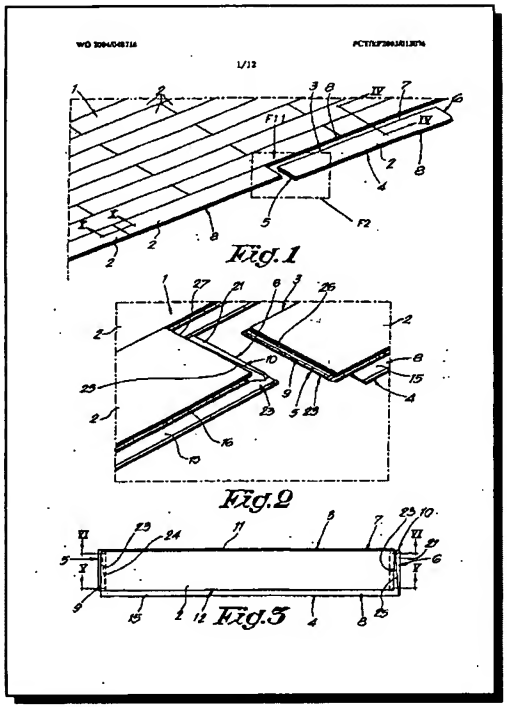


Fig.1
Fig.2
Fig.3

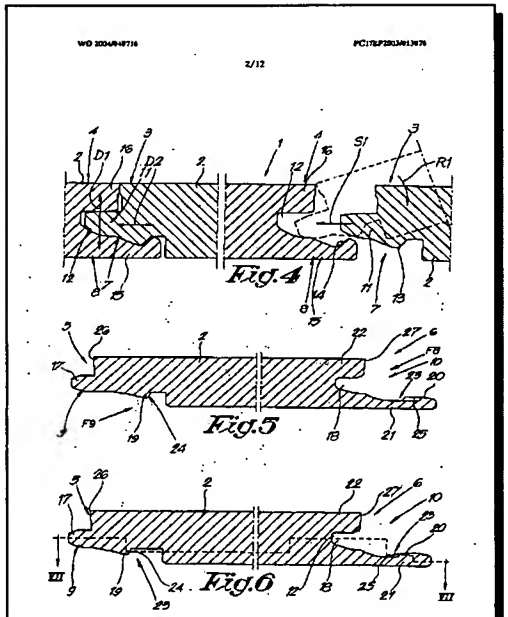


Fig.4
Fig.5
Fig.6

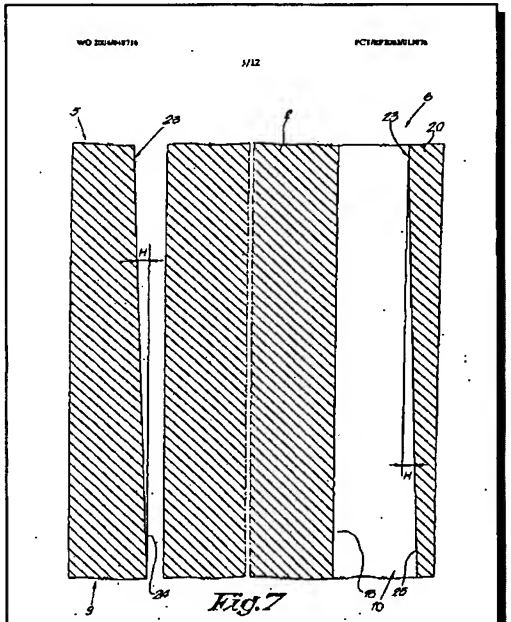


Fig.7

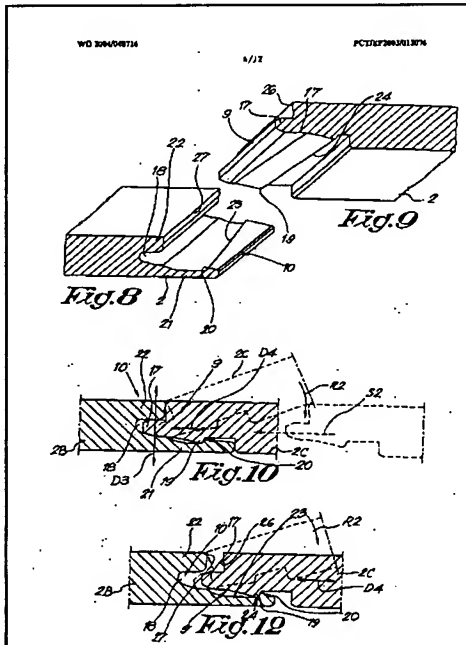


Fig.8
Fig.9
Fig.10
Fig.12

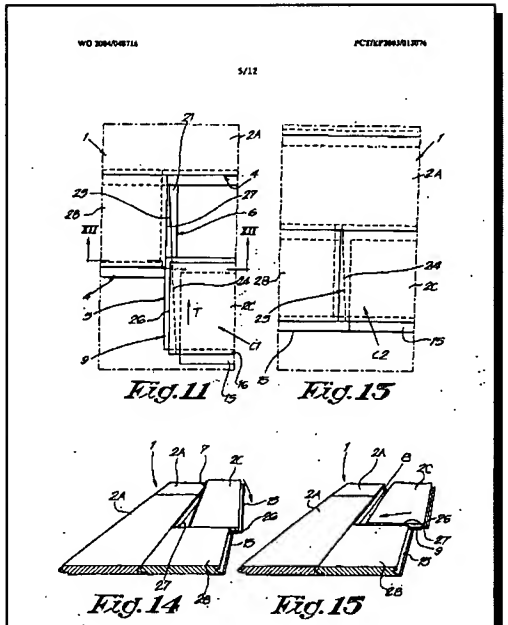


Fig.11
Fig.13
Fig.14
Fig.15

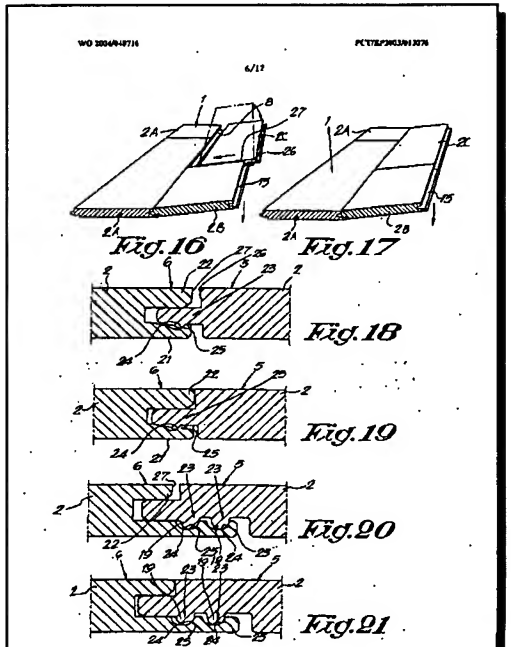


Fig.16
Fig.17
Fig.18
Fig.19
Fig.20
Fig.21

FLOOR PANEL FOR FLOOR COVERINGS, PLACING AND MANUFACTURE THEREOF

Description of **WO2004048716**

<Desc/Clms Page number 1>

FLOOR PANEL FOR FLOOR COVERINGS, PLACING AND MANUFACTURE THEREOF The present invention relates to a floor panel, a method for placing such floor panels, as well as to a method for the manufacture thereof.

In the first place, the invention is intended for application with laminated floor panels, however, in general it can also be applied with other forms of floor panels, either solid flooring parts, or flooring parts composed of different parts.

By laminated floor panels, hereby all kinds of floor panels have to be understood which show a laminated structure.

Mostly, such laminated floor panels possess at least one core layer and a top layer, whereby the core layer, for example, consists of MDF, HDF, particle board, so-called compact laminate or such, whereas the top layer, for example, consists of different sheets of material which are pressed on top of each other, such as paper layers soaked in resin, amongst which a printed decorative layer, or of another layer of material, such as cork, veneer, a relatively thick layer of wood, whether or not formed of lamellae, and so on.

More particularly, the invention relates to a floor panel for forming a floor covering, which, at least at two opposite edges, is provided with coupling parts which allow to couple two of such floor panels to each other, such that thereby a locking is obtained in a direction perpendicular to the plane of the floor panels, as well as in a direction

<Desc/Clms Page number 2>

in the plane of the floor panels and perpendicular to the coupled edges, whereby these coupling parts in coupled condition allow a mutual shifting of the floor panels over at least a well-defined length substantially in the longitudinal direction of said edges.

Examples of such floor panels are, amongst others, known from the international patent applications WO 97/47834 and WO 94/26999.

A difficulty when placing such floor panels consists in that, when two of such floor panels during placement have to be shifted in mutual respect in longitudinal direction, this may be rather difficult in certain applications, often with the risk that the floor panels also will be damaged.

So, for example, with longitudinal floor panels, whereby a first floor panel, which already is coupled at one longitudinal edge to an already installed row of floor panels, which, however, is held with one hand at an angle in respect to the plane of the floor covering, it is relatively difficult to couple a second floor panel to a short side of the first floor panel and shift it in coupled condition in the plane of the first floor panel up to the edge of the already installed row. Due to the oblong shape of the floor panels, it is thereby in fact difficult to keep the second floor panel precisely in the prolongation of the first floor panel, and with the least deviation, a clamping effect occurs in the coupling parts at the short sides, as a result of which a person installing the floor panels often will start to pull at the floor panels, as a consequence of which the damage risk increases considerably, the more because, due to the oblong design of the floor panels, each torsion thereof will effect large

<Desc/Clms Page number 3>

lever forces in the coupling parts of the short sides.

This risk is particularly real when the floor panels at the respective edges where such risk may occur are joined with a press fit or precise fit, however, it also exists when they fit into each other with a small play.

Another difficult situation arises when two floor panels, which are provided with coupling parts fitting together with a press fit, must be manually shifted, for example, when they are in a mutual position in which it is difficult to use a tool. Due to the fact that such press fit usually is present over the entire length, a manual shifting thus often is impossible.

For mutually connecting floor panels at their longitudinal as well as their short sides, it is known to make use of metal clips which are fixed in grooves at the lower side of the floor panels. This is described in WO 01/27410. At the short sides of the floor panels, use is made of at least one groove extending inclined in respect to the adjoining edge, such that, when the floor panels are moved in a direction perpendicular to the longitudinal edges, automatically an approach between the short edges to be coupled will occur. As the grooves, however, have a length which is larger than the width of the clips, these clips may end up at various places in these grooves, whereby consequently never a perfect adjoining at the short sides can be guaranteed. Another disadvantage of the use of separate clips consists in that those may come into an oblique position, which results in a clamping, such that any further shifting will be excluded. Also, it is not excluded that the clips press themselves out of the grooves when too large undesired forces are exerted during the

<Desc/Clms Page number 4>

installation of the floor panels.

In general, the present invention aims at a floor panel which is realized such that the placement thereof is facilitated, however, at the same time still a good coupling can be realized. More specifically, it also aims at a floor panel which allows to offer a solution for the aforesaid and other disadvantages.

To this aim, the invention relates to a floor panel for forming a floor covering, which, at least at two opposite edges, is provided with coupling parts which allow that two of such floor panels can be coupled to each other, such that thereby a locking is obtained in a direction perpendicular to the plane of the floor panels, as well as in a direction in the plane of the floor panels and perpendicular to the coupled edges, whereby these coupling parts in coupled condition allow for a mutual shifting of the floor panels over at least a well-defined length substantially in the longitudinal direction of said edges, with as a characteristic that the floor panel, at said edges, is provided with integrated means which bring the floor panels, during said shifting movement, as a consequence of this shifting movement, from a first condition into a second condition, whereby the floor panels in the second condition are coupled more tightly and/or closer to each other than in the first condition.

By providing the floor panel with said integrated means, the floor panels, in a mutual position in which said first condition occurs, can be coupled to each other, after which they can be brought into the second condition by means of a mutual shifting. This offers the advantage that the floor panels first can easily be engaged into each other and

<Desc/Clms Page number 5>

subsequently smoothly can be moved at least fora part of the necessary mutual shifting, whereas the risk of a less easy movement increases only in a further stage of the shifting.

As said means are realized as integrated means, with which is meant that they are formed by parts which, during manufacture, are fixedly provided at the floor panels, or by parts which are realized in one piece out of at least the edge part of the actual floor panel, is achieved that said means always are situated at the same place in respect to the respective floor panels and that no undesired movements can occur, as this is the case with said known clips.

Said integrated means preferably consist of guide-forming portions provided at the respective edges of the floor panels, more particularly at the respective coupling parts, more particularly contact parts which, over at least a part of their length, show a course according to a direction deviating from the direction in which the actual edge of the floor panel itself extends. More particularly is preferred that these guide-forming portions consist of locking parts which prevent that the floor panels will come loose from each other in a

direction parallel to the plane of the floor covering and perpendicular to the coupled edges.

By realizing the integrated means in the form of guide- forming portions, which preferably also fulfill a locking function, the advantage is created that those means easily can be realized together with the actual coupling parts.

Said integrated means can be realized according to

<Desc/Clms Page number 6>

different preferred forms of embodiment, as will further be set forth in the detailed description and the drawings.

According to an important form of embodiment, the floor panels are rectangular and on all four sides provided with coupling parts allowing a locking among the coupled floor panels in horizontal as well as vertical direction, and said integrated means, more particularly said guide-forming portions, are provided at only two opposite edges. In the case of oblong floor panels, these edges preferably are the edges situated at the short sides. Hereby, floor panels are obtained which, as set forth in the following, can easily be installed without tools, even if coupling parts are applied which provide for a tight fit of the floor panels.

According to the present invention, the method for installing such floor panels is characterized in that it at least comprises the steps consisting in that a first floor panel and a second floor panel at their edges, which are provided with integrated means, as aforementioned, are presented to each other in a mutually staggered position and that the floor panels are shifted in mutual respect, such that, as a result of this shifting, the floor panels are brought from the first condition into the second condition.

According to the invention, the method for manufacturing such floor panels is characterized in that at least the coupling parts at the edges at which said integrated means are provided, as well as those integrated means, are formed of the material of which the floor panels consist, by means of a machining process, more particularly a milling process, whereby the integrated means are realized in the form of guide-forming portions, whereby at least these

<Desc/Clms Page number 7>

guide-forming portions are realized by moving the respective floor panel and at least one machining tool mutually along one another, such that the machining tool and the floor panel perform a mutual displacement, the direction of which, at least for a part of the performed course, deviates from the direction of the actual pertaining edge of the floor panel. Hereby, as set forth in the following, different preferred techniques can be applied. Further details of the method will become clear from the following description and claims.

With the intention of better showing the characteristics of the invention, hereafter, as an example without any limitative character, several preferred forms of embodiment are described, with reference to the accompanying drawings, wherein:
Figure 1 represents a part of the floor covering according to the invention; figure 2, at a larger scale, represents the part indicated by F2 in figure 1; figure 3 represents a floor panel from figure 1 in top view, whereby the coupling parts at the edges are represented exceedingly large; figure 4, at a larger scale, represents a cross-section according to line IV-IV in figure 1; figures 5 and 6, at a larger scale, represent cross- sections according to lines V-V and VI-VI in figure 3; figure 7 represents a cross-section according to line
VII-VII in figure 6; figures 8 and 9, at a larger scale, in perspective as well as schematized, represent the edge portions indicated by arrows F8 and F9 in figure 5; figure 10, at a larger scale, represents a cross-

<Desc/Clms Page number 8>

section according to line X-X in figure 1, figure 11 represents a view according to arrow FII in figure 1 during the installation of the floor panels; figure 12, at a larger scale, represents a cross- section according to line XII-XII in figure 11; figure 13 represents a view analagous to that of figure 11, however, for another condition; figures 14 to 17 in perspective view further illustrate a method of placing the floor panels; figures 18-19 and 20-21 represent two variants in cross-sectional view; figure 22, in plan view, represents another variant of two floor panels according to the invention; figure 23, at a larger scale, represents a cross-

section according to line XXIII-XXIII in figure 22; figure 24 represents a cross-section similar to that of figure 23, however, after being shifted into each other and for another location alongside the coupled edges; figures 25 and 26 schematically represent another variant; figures 27 to 29 illustrate a further variant; figures 30 to 34 represent various portions and views of a particular form of embodiment of a floor panel according to the invention; figure 35 schematically represents another variant; figures 36 to 38 represent views similar to those of figures 22 to 24, however, for a further particular form of embodiment; figure 39 represents a view analogous to that of figure 37, however, for a variant; figure 40 in perspective view represents an edge portion of a further variant; figures 41 to 44, strongly schematized, represent the edge portions of still another number of variants of

<Desc/Clms Page number 9>

floor panels according to the invention; figure 45 represents the edge portions of another particular form of embodiment; figures 46 and 47 schematically represent two techniques for manufacturing floor panels according to the invention; figure 48 in perspective view represents another two edge portions, which belong together, of a floor panel according to the invention.

In figures 1 and 2, a floor covering 1 is represented which is composed of floor panels 2 according to the invention.

In the represented example, the floor panels 2 are rectangular and oblong and show a first pair of opposite edges 3-4, in this case at the long sides, and a second pair of opposite edges 5-6, in this case at the short sides, which respectively are provided with coupling parts 7-8 and 9-10.

The coupling parts 7-8, at least in the represented form of embodiment, are realized such that, when two floor panels 2 are connected at the edges 3-4 by means of these coupling parts 7-8, a locking is obtained in a direction D1 perpendicular to the plane of the floor panels 2, as well as in a direction D2 in the plane of the floor panels 2 and perpendicular to said edges 3-4, as indicated in figure 4.

In cross-section, these coupling parts 7-8 have a substantially uniform design, such that, regardless of the mutual position of two floor panels 2 along the edges 3-4, always one and the same coupled condition is obtained. The coupled floor panels 2 can be shifted in longitudinal direction in respect to each other along the edges 3-4, whether by means of a tool or not.

<Desc/Clms Page number 10>

According to the represented form of embodiment, the coupling parts 7-8 consist of parts, 11-12, respectively, in the form of a tongue and a groove, which provide for that a locking in the direction D1 is obtained, as well as of portions 13-14 consisting of contact surfaces which provide for a locking in the direction D2.

Hereby, the coupling parts 7-8 are realized such that they allow the mutual coupling of two of such floor panels 2 at their edges 3-4, by shifting them laterally towards each other in a substantially flat manner, as well as by joining them by means of a mutual turning movement, as indicated in figure 4 by arrows S1 andR1, respectively. Such coupling parts 7-8, which possibly can be realized such that in coupled condition a permanent tension is created with which the coupled floor panels 2 are forced towards each other, are known, amongst others, from WO 97/47834.

It is clear that according to a not-represented variant, also other forms of coupling parts 7-8 might be applied, which, for example, only allow a coupling by means of a turning movement R1 or, for example, only by means of a shifting movement S1, or by a combined movement.

In order to be able to turn the floor panels 2 at their edges 3-4 smoothly into each other, out of each other, respectively, the lip 15 which borders the lower side of the groove, as represented, preferably is realized longer than the lip 16 which borders the upper side, and the portion 14 thereby preferably also is situated in that part of the lip 15 which extends beyond the lip 16. The lip 15 preferably is elastically bendable in order to allow for a > snap=-action with said movementS1.

<Desc/Clms Page number 11>

As represented in figures 5 to 10, the coupling parts 9-10 to a large extent are realized similar to the coupling parts 7-8. In coupled condition, they also provide for locking effects in directions D3 and D4, similar to the locking actions in the directions D1 and D2. Moreover, they also consist of parts, 17 and 18, respectively, which are realized in the form of a tongue and a groove, as well as of portions 19-20 providing for a horizontal locking in the plane of the floor covering 1.

Further, the coupling parts 7-8 preferably also allow for a mutual coupling of two of such floor panels 2 at the edges 5-6, by shifting them laterally in a substantially flat manner towards each other, as well as by joining them by means of a mutual turning movement, as indicated in figure 10 by arrows S2 and R2, respectively; however, variants to this are also possible. In order to allow a smooth turning into each other and out of each other also at the edges, the portion 20 is also provided in a lip 21 at the lower side of the groove which extends further than the extremity of the lip 22 bordering the upper side of the groove.

The particularity of the present invention consists in that the floor panel 2, at the edges 5-6, is provided with integrated means 23 which, when two of such floor panels 2 are mutually coupled at the edges 5-6, can be brought from a first condition C 1 into a second condition C2 by means of a shifting movement T, whereby, as further also described by means of figures 11 to 13, the floor panels 2 in the second condition C2 are coupled more tightly and/or closer together than in the first conditionC1.

The integrated means 23 consist of guide-forming portions

<Desc/Clms Page number 12>

24-25 provided at the edges 5-6, more particularly contact parts, of which at least one and preferably both show over at least a part of their length a global course according to a direction which deviates from the direction according to which the actual edges 26-27 of the floor panel 2 itself extend, whereby these guide-forming portions 24-25 in the represented example principally are formed by said parts 19-20 providing for the locking in the direction D4. Thus, this means that the coupling parts 9-10, seen in cross- section, do not show a uniform form over the complete length of the respective edges 5-6.

In the form of embodiment of figures 1 to 13, the guide- forming portions 24-25 have a straight course which, as clearly visible in figure 7, extends according to a direction which describes a small angle H in respect to the direction of the edges 26-27. In reality, this angle preferably shall be situated between several tenths of a degree and several degrees.

The installation of the floor panels 2, and more particularly the realization of the coupling at the edges 5-6, then preferably takes place as described in the following with reference to figures 10 to 13, wherein the floor panels in general have the reference number"2", however, for distinction=s sake, also are indicated by sequential letters A-B-C.

In figure 11, a condition is represented whereby a second floor panel 2C must be coupled to a first, already installed floor panel 2B which, in its turn, is already coupled to a preceding row of floor panels 2A. Hereby, the floor panel 2C is coupled to the floor panel 2B in a first position CI, whereby it is situated at a distance to the

<Desc/Clms Page number 13>

edge of the already installed row of floor panels 2A, such coupling being performed preferably by means of a turning movement R2, as illustrated in figure 12.

In position CI, the coupling parts 9-10 fit into each other with a rather loose fit, as becomes clear from figure 12.

Hereby, it is meant that at least in the direction D4 a free shifting is possible between the floor panels 2B and 2C, without a mutual uncoupling of coupling parts 9-10.

By shifting the floor panel 2C from position CI towards the floor panels 2A by means of said movement T, and by the fact that the guide-forming portions 24-25, together with the edges 26-27, define a wedge-

shaped narrowing, it is obtained that the fit with which the coupling parts 9-10 cooperate, systematically becomes tighter, preferably such that at that moment when the floor panel 2C adjoins the edge of the floor panels 2A, it also adjoins against the floor panel 2B with a tight and possibly press fit, as becomes clear from figure 13.

It is clear that thereby the coupling of floor panel 2C to floor panel 2B is considerably facilitated. At the start, in position CI, the coupling parts 9-10 are sitting rather loosely in each other, or there is at least no forced contact or forced close cooperation between the edges 26- 27, as a result of which the floor panel 2C can be shifted in a smooth manner, such that solely at the end of the shifting movement of the floor panel 2C along the floor panel 2C a less smooth shifting may occur. As this shifting becomes more difficult exclusively at the end of the performed movement, the floor panels 2B-2C generally can be shifted more easily, such with a minimum risk of damage.

The assembly allows that, if necessary, a manual shifting in direction T remains possible, however, finally a tight

<Desc/Clms Page number 14>

fit between the floor panels can be guaranteed. By"tight fit"hereby is meant that the floor panels 2B and 2C are seated with their edges 26-27 close to each other, and still better contact each other and preferably even fit against each other with a tension.

By choosing the course of the guide-forming portions 24 and 25 in a suitable manner, different effects can be obtained.

It is, however, clear that the integrated means 23 preferably are configured such that said second condition at least occurs in the position whereby the floor panels 2B and 2C are aligned. More particularly, it is preferred that the floor panels 2B and 2C in the second condition adjoin each other without play, and even better are pressed against each other as a result of an elastic bending or deformation in the coupling parts 9-10. It is also preferred that the free of play-condition and/or the condition in which the floor panels 2B and 2C by the intermediary of the coupling parts 9-10 are tensioned against each other, is only reached at that moment when the floor panels 2B and 2C come into a position whereby they are situated precisely opposite each other, or shortly therebefore.

According to the invention, the floor panels 2, when, as represented in figures 1 to 13, they are provided at the edges 3-4 as well as 5-6 with coupling means 7-8 and 9-10 which allow to realize a coupling by means of a turning movement, preferably are installed in the manner set forth in the following, with reference to figures 14 to 17.

Herein, for clarity=s sake, the floor panels, analogous to figure11, also are indicated by 2A, 2B and 2C, respectively, whereby by 2A, the floor panels of an already placed row are indicated, by 2B, a first floor panel is

<Desc/Clms Page number 15>

indicated which is already coupled to the placed row of floor panels, and by 2C, a second floor panel is indicated which must be coupled to the floor panel 2B as well as to the floor panels 2A.

As illustrated in figure 14, first the floor panel 2C is connected with a short side to the floor panel 2B, such at a distance, preferably a very small distance, from the row of floor panels 2A. The easiest way to realize this is to couple the floor panel 2C to the floor panel 2B by means of a turning movement, as a result of which a condition is created as represented in figure 15, whereby the floor panels 2B and 2C at the location of the coupling parts 9-10 then are sitting rather loosely in each other and/or with their edges 26-27 at a distance from each other.

In a following step, the floor panel 2B is turned somewhat upwards, as illustrated in figure 16, whereas the floor panel 2C is kept in one and the same plane as the floor panel 2B. From this position, the floor panel 2C can be smoothly shifted downward, along the short side of the floor panel 2B, until it is situated in the prolongation of the floor panel 2B, as a result of which the tongue, formed by the coupling part 7 of the floor panel 2C, arrives in the groove of the coupling part 8 of one or more of the floor panels 2A, as a consequence of which at the short sides a condition is obtained as in figure 10. By subsequently turning

both floor panels 2B and 2C downwards, all floor panels 2A-2B-2C are coupled to each other.

Also owing to the present invention, with this method no major manual forces must be exerted in order to install the floor panels 2, even when the coupling parts 7-8 and 9-10 are realized with a tight fit or press fit.

<Desc/Clms Page number 16>

Instead of performing the steps according to figures 14 and 15, one may also directly start from a condition whereby, as represented in figure 16, the floor panel 2B is held in a somewhat upward-turned condition and the floor panel 2C thereby is connected at the short side to the floor panel 2B by means of a turning movement, starting from a position as indicated in dash-dotted line. Thereafter, one may continue in the same manner.

However, the aforegoing does not exclude that the respective floor panels 2A-2B-2C can be mutually connected in other ways, for example, by means of said movements S1 and S2. It is also possible to couple the floor panel 2C to the floor panel 2B at a larger distance from the already installed floor panels 2A, by means of a displacement S2 or a turning movement R2. In principle, it is also not excluded to shift the floor panel 2C with the coupling part 9 entirely from the front end of the edge 6 of the floor panel 2B into the profiled edge of the floor panel 2B.

Figures 18 and19, which show views for a variant according to cross-sections similar to those of figures 12 and 10, show that the invention can also be realized with embodiments whereby the lower lip 21 does not necessarily have to be longer than the upper lip 22.

Figures 20 and 21 represent for similar views a variant whereby at the edges 5-6 respectively two parts 19-20 are formed, which both also serve as guide-forming portions 24- 25.

In the form of embodiment of figures 1 to 17, the floor panels 2, more particularly 2B and 2C, are coupled into

<Desc/Clms Page number 17>

each other in the first position CI with a play which allows that, as can be seen in figure 12, the floor panel 2C can be moved between two extreme positions, to wit a first position whereby the guide-forming portions 24-25 are in contact with each other, and a second position whereby the edges 26-27 are in contact with each other. It is noted that this must not necessarily be so, which is illustrated by means of the form of embodiment of figures 22 to 24, whereby the floor panels 2B and 2C in the first position CI can not come into contact with the edges 26-27, as the represented projection 28 necessarily follows the course of the corresponding groove 29.

In to plan view and for two different positions, figures 25 and 26 represent a variant of two floor panels 2 to be coupled, whereby said guide-forming portions 24-25 have a course in which at least one step-shaped alteration, and in this case even two of these alterations 30, is present, contrary to the gradually changing course of the guide- forming portions 24-25 in the form of embodiment of figures 1 to 17. In the mutual position represented in figure 25, there is a loose coupling, whereas by a shifting up into the position of figure 26 a tight fit or press fit between the floor panels is obtained, more particularly at the edges 26-27.

In figures 27 to 29, an example is represented of a form of embodiment whereby the edges 5-6, at which the integrated means 23 are provided, comprise parts 31-32, which, when two of such floor panels 2 are presented in one and the same plane with these edges 5-6 in a mutually staggered position opposite to each other, freely fit over each other when shifted towards each other, however, with a subsequent shifting in the longitudinal direction of the edges 5-6

<Desc/Clms Page number 18>

engage behind each other with the guide-forming portions 24-25.

In the example from figures 27 to 29, the guide-forming portions 24-25 to this end do not only extend in an

inclined direction in the plane of the floor panel 2, however, also the height of these parts 24-25 changes, as the parts 31-32 vary in thickness. In the case when two of such floor panels 2 then are presented to each other in a position analogous to that of figure 11, those panels can be shifted freely over each other with the parts 31-32, as can be seen in figure 29, until the edges 26-27 adjoin each other, after which the guide-forming portions 24-25, as aforementioned, can be brought behind each other by a mutual shifting of the floor panels 2 in the longitudinal direction of the edges 5-6, whereby then automatically a forced tight fit is obtained.

Figures 30 and 31 show parts of an embodiment whereby transversely directed recesses 33-34 are formed in the edges 5-6. As schematically and stepwise represented in figures 32 to 34, these recesses 33-34 allow for that two floorpanels 2 with their coupling parts 9-10 can be moved freely towards each other by means of a first movement M1, whereby the two floor panels are staggered in respect to each other, after which those floor panels 2 can be brought with their coupling parts 9-10 and with said guide-forming portions 24-25 behind one another, by means of a second movement M2, substantially crosswise to the first.

Hereby, the guide-forming portions 24-25 in their turn each consist of two segments 24A-24B and 25A-25B. In the form of embodiment of figures 30 to 34, both segments 24A-24B, as well as both segments 25A-25B, are situated in each other=s

<Desc/Clms Page number 19>

prolongation. Figure 35 shows a variant showing that these segments do not necessarily have to be situated in each other=s prolongation.

Figures 36 to 38 show a form of embodiment whereby at the edges 5-6 coupling parts 9-10 and guide-forming portions 24-25 are provided, which are configured such that, when two of such floor panels 2 are presented with these edges 5-6 to each other, the latter, in at least one mutual position of the two floor panels, to wit the position CI from figure 36, can be brought with their guide-forming portions 24-25 behind each other, by means of a mutual movement M3 perpendicular or substantially perpendicular to the plane of the floor panels 2, by means of a so-called "drop-in"movement. This movement is represented in figure 37, whereby it is clear that the tip 35 of the tongue of the right-hand floor panel 2, when let down, can pass freely along the edge 27. By the shifting along the edges 5-6, a coupled condition is obtained as illustrated in figure 38.

The parts which are made as a tongue and a groove can be realized in all forms of embodiment in a different manner.

Figure 39 shows as an example a variant of the form of embodiment of figure 37, whereby the coupling parts9-10 are realized as a double tongue and groove-connection.

Preferably, the coupling parts 7-8 and/or 9-10 are made in one piece, more particularly integrally, with the material of which at least the edge portion of the actual floor panel 2 is made, and are they formed out of this edge portion, for example, by means of a machining process.

Preferably, the coupling parts 7-8 and/or 9-10 are formed out of a core of such floor panel 2, which consists of MDF (Medium Density Fibreboard) or HDF (High Density

<Desc/Clms Page number 20>

Fibreboard). The use of this material offers various advantages. For example, smooth surfaces can be realized out of MDF/HDF, as a result of which the floor panels 2 can be smoothly shifted along each other in coupled condition.

However, the invention is not limited to embodiments whereby the coupling parts 7-8 and 9-10 are realized in one piece out of the material of the floor panels 2 themselves.

As schematically represented in figure 40, the inventive idea also can be realized with, for example, a coupling part 10, a portion of which, amongst which the guide- forming part 25, is made of a strip 36 provided at the actual floor panel 2 and consisting of another material, for example, metal. Also, the coupling parts 7 and/of 8 and/or 9 and/or 10 may consist entirely of another material than the floor panels

themselves.

In figure 41, a particular form of embodiment of the present invention is represented, whereby said integrated means 23 comprise at least a guide-forming part 37, in this case a rounding which allows that two of such floor panels 2, when laterally shifted into each other, substantially according to the longitudinal direction of their edges, initially can be brought from a first condition into a subsequent condition, whereby the floor panels 2 in said subsequent condition are coupled more tightly and/or closer to each other than in the first condition. Thus, the part 37 has the purpose to provide for that the floor panels 2 initially can be engaged more smoothly into each other with their coupling parts 9-10, and according to a variant possibly also parts 7-8.

Thus, the rounding 37 provides for a self-centering effect among the floor panels, to wit in that this rounding 37

<Desc/Clms Page number 21>

forms a guide for the angle point 28a of the protruding part 28 during the shifting into each other according to the direction indicated in the figure.

As indicated by reference 27A, said portion also may consist of an inclined part or such. According to another variant, such portion 37,37A, respectively, also may be provided at the edge 3 or 5 instead of at the edge 4 or 6.

Also, portions 37 can be formed at both edges 3-4 and/or 5- 6, said edges cooperating during coupling.

Figures 42 to 44 schematically represent a number of forms of embodiment, according to views analogous to that of figure 41, whereby also guide-forming portions 37,37A, respectively, are formed at the floor panels 2.

Figure 45 shows another variant with coupling parts 9-10 which, when two floor panels 2 are presented with their edges 5-6 above one another, can be snapped-on in each other, or can be brought behind one another by a shifting movement with the guide-forming portions 24-25.

In general, the cooperation between the guide-forming portions 24-25 preferably shall be such that in the second condition a fit-forming cooperation between the respective guide-forming portions 24-25 is obtained, this at two or more locations distributed over the length of the cooperating edges 5-6, as, for example, in the forms of embodiment of figures 25-26 and 30 to 35, or continuously over the major part of the length of these edges 5-6, as in the form of embodiment of figures 1 to 17.

In figure 46, a method for manufacturing such floor panels is represented schematically, more particularly for the application of the profile edges 3-4 and 5-6 by means of

<Desc/Clms Page number 22>

machining tools, such as rotating milling cutters 38 to 43.

Hereby, the manner in which, on one hand, the straight portions of the coupling parts 9-10 and, on the other hand, the oblique guide-forming portions 24-25 are provided at the edges 5-6 is essential.

According to the technique of figure 46, the floor panels 2 hereby are guided, by means of a transport element 44, parallel with the edges 5-6 alongside the necessary milling cutters 40-41 in order to form the straight portions of the coupling parts 9-10, whereas the oblique guide-forming portions 24-25, and possibly certain portions of the actual coupling parts 9-10, too, are realized by moving the floor panels 2 in a tilted condition along milling cutters 42 and 43.

This can be realized by making use of a transport element 44 with engaging cams 45, whereby this transport element 44 locally at one side is somewhat diverted, as indicated by references 46 and 47.

In figure 47, a variant is represented whereby the inclined-extending guide-forming portions 24-25 are realized by performing a mutual lateral displacement, Z1 and Z2, respectively, between the milling cutters 42 and 43 and the floor panel 2, preferably by displacing the milling cutters 42-43 according to a well-

defined course at the moment when a floor panel 2 is moved along them, which possibly can be realized by a cam system, a step motor or the like.

It is clear that the floor panels 2 for forming the edges 3-4 can be guided in a traditional manner along milling cutters 38-39 or other suitable tools, as schematically

<Desc/Clms Page number 23>

represented in figure 46. Hereby, the coupling parts 7-8 at the long sides do not necessarily have to be provided first.

Of course, possibly more milling cycles can be performed than represented in figures 46 and 47, if the profile pattern of the edges 3-4 and/or 5-6 requires this.

The present invention is in no way limited to the forms of embodiment described as an example and represented in the figures, however, such floor panel, the floor covering formed therefrom, the method for the placement thereof and the method for the manufacture thereof can be realized according to various variants, without leaving the scope of the invention.

For example, the invention may also be applied in embodiments whereby the locking in horizontal direction and the integrated means 23 are realized not only at the lower lip of the groove, but, for example, at the lower and upper lip, or at the upper lip only, this regardless whether the lower lip is longer, shorter or equal to the upper lip.

Figure 48 represents another variant which shows that the invention also is applicable in embodiments of the type where the lip bordering the upper side of the groove extends up to beyond the lip bordering the lower side of the groove, and whereby the guide-forming part 25 is situated in the thus upper and further-protruding lip.

In principle, the invention can be applied in combination with all kinds of coupling means providing for a vertical and horizontal locking, regardless in which manner whatsoever the panels initially have to be joined together.

<Desc/Clms Page number 24>

Also, the invention is not limited to oblong floor panels.

In function of the embodiment, the integrated means 23 can be provided at two or more sides, possibly at the long sides, too. In case that the floor panels are realized as tiles which are installed in a non-staggered manner, the application of integrated means 23 at the four sides is particularly advantageous.

The fact that, according to the invention, the floor panels in the second position are coupled more tightly and/or closer to each other, does not exclude that the floor panels 2 in the first condition are presented with their edges, for example, 26 and 27, against each other. However, in the first position the contact between the edges 26-27 is no"forced"condition, whereas in the"second condition" the edges indeed are forced to come into mutual contact or at least are forced close to each other.

FLOOR PANEL FOR FLOOR COVERINGS, PLACING AND MANUFACTURE THEREOF

Claims of **WO2004048716**

Claims.

1.-Floor panel for forming a floor covering (1), which, at least at two opposite edges (5-6), is provided with coupling parts (9-10) which allow that two of such floor panels (2) can be coupled to each other, such that thereby a locking is obtained in a direction (D3) perpendicular to the plane of the floor panels (2), as well as in a direction (D4) in the plane of the floor panels(2) and perpendicular to the coupled edges (5-6), whereby these coupling parts (9-10) in coupled condition allow for a mutual shifting (T) of the floor panels (2) over at least a well-defined length substantially in the longitudinal direction of said edges (5-6), characterized in that the floor panel (2) at said edges (5-6) is provided with integrated means (23) which bring the floor panels (2) during said shifting movement (T), as a consequence of this shifting movement (T), from a first condition(CI) into a second condition (C2), whereby the floor panels (2) in the second condition (C2) are coupled more tightly and/or closer to each other than in the first condition(C1).

2. -Floor panel according to claim 1, characterized in that the coupling parts (9-10) and said integrated means (23) are configured such that the second condition (C2) at least takes place in the position in which the floor panels (2) are aligned.

3. -Floor panel according to claim 1 or 2, characterized in that the floor panel (2) is rectangular, more particularly oblong or square, thus having a first pair and a second pair of opposite edges (3-4,5-6), that at the first pair of opposite edges (3-4), coupling parts (7-8) are formed

<Desc/Clms Page number 26>

which allow for that two of such floor panels (2) can be coupled together at those edges (3-4), such that thereby a locking in a direction <RTI (D1) perpendicular to the plane of the floor panels (2) as well as in a direction (D2) in the plane of the floor panels (2) and perpendicular to the coupled edges (3-4); and that the second pair of opposite edges (5-6) is provided with the coupling parts (9-10), which, as aforementioned, allow to bring the floor panels (2), by means of a shifting movement, from a first condition (CI) into a more closing and/or closer second condition.

4. -Floor panel according to claim 3, characterized in that</RTI> the coupling parts (7-8) of the first pair of opposite edges (3-4) allow that two of such floor panels (2) can be shifted according to the longitudinal direction of these edges (3-4), whether by means of a tool or not, whereby, seen in cross-section, substantially only one coupled condition takes place, regardless in which mutually displaced position these floor panels (2) are.

5. -Floor panel according to claim 3 or 4, characterized in that this floor panel (2) is oblong; that the first pair of opposite edges (3) is situated at the long sides; and that the second pair of opposite edges (5-6) is situated at the short sides.

6. -Floor panel according to any of the preceding claims, characterized in that the integrated means (23) which allow to bring mutually coupled floor panels (2) from said first condition <RTI (CI) into said second condition (C2) are realized such that at least in the first position a space and/or play exists between the coupled floor panels (2).

<Desc/Clms Page number 27>

7. -Floor panel according to any of the preceding claims, characterized in that the integrated means (23) which allow to bring mutually coupled floor panels (2) from said first condition (CI) into said second condition (C2) are realized such that the floor panels (2), at least in the second position, adjoin each other without play, whereby they are either pressed against each other with a certain force as a result of an

elastic bending or deformation in the coupling parts (9-10) or not.

8. -Floor panel according to any of the preceding claims, characterized in that said integrated means (23) consist of guide-forming portions (24-25; 37-37A) provided at the respective edges (5-6) of the floor panels (2), more particularly at the respective coupling parts (9-10), more particularly contact parts of which at least one shows a global course according to a direction which deviates from the direction according to which the actual pertaining edge (26-27) of the floor panel (2) extends.

9. -Floor panel according to claim 8, characterized in that the coupling parts (9-10) at the edges (5-6) which are provided with said integrated means (23), on one hand, at least comprise portions (17-18) in the form of a tongue and groove, and, on the other hand, also at least comprise portions (19-20) which effect a locking in a direction (D4) in the plane of the floor panels (2) perpendicular to the coupled edges (5-6), whereby these last-mentioned portions (19-20) also form said guide-forming portions (24-25).

10. -Floor panel according to claim 9, characterized in that the portion (17) realized as a tongue becomes more narrow towards the tip of the tongue and/or the portion (18) realized as a groove becomes more narrow towards the

inside, such that the portion (17) realized as tongue, in said first condition (CI) at least at one side of the upper side or lower side is situated at a distance from the wall of the groove, whereas in said second condition (C2) the upper side as well as the lower side of the portion realized as a tongue contact the upper wall, lower wall, respectively, of the portion (18) realized as a groove.

11.-Floor panel according to claim 9 or 10, characterized in that the guide-forming portions (24-25) are situated at, on one hand, the lip (21) bordering the lower side of said groove and/or a portion present at this lip (21) and, on the other hand, the portion of the opposite edge (5) corresponding thereto.

12. -Floor panel according to claim 9 or 10, characterized in that the guide-forming portions (24-25) are situated at, on one hand, the lip (21) bordering the lower side of the groove and/or a portion present at this lip (21) and, on the other hand, the portion of the opposite edge (5) corresponding thereto, that said lip (21) and/or the portion present thereon extends beyond the lip (22) bordering the upper side of said groove; and that the guide-forming portion (25) situated at the lip (21) bordering the lower side of the groove and/or at the portion present thereon, is situated at a location which is situated beyond the lip (22) bordering the upper side of the groove. <RTI

13. -Floor panel according to any of the claims 8 to 12,</RTI> characterized in that the guide-forming portions (24-25) have such a course that, when two of such floor panels (2) are coupled to each other, said second condition (C2) is only reached at that moment when the floor panels (2) come

<Desc/Clms Page number 29>

into a position where they are precisely opposite to each other, or shortly therebefore.

14. -Floor panel according to any of the claims 8 to 13, characterized in that at least one of the respective edges (5-6) has a guide-forming part (24-25) having a course which gradually alters over the major portion of the length of the respective edge (5-6).

15. -Floor panel according to claim 14, characterized in that said guide-forming part (24-25) extends over the entire or almost entire length of the edge (5-6) with an inclination (H) in respect to the direction of the pertaining actual edge (26-27) of the floor panel (2).

16. -Floor panel according to any of the claims 8 to 13, characterized in that at least one of the respective edges (5-6) has a guide-forming part (24-25) having a course in which at least one step-shaped alteration (30) is present.

17. -Floor panel according to any of the claims 8 to 16, characterized in that in the edges (5-6) which comprise said integrated means (23), crosswise-directed recesses (33-34) are formed, such that two of such floor panels (2) with their coupling parts (9-10) can freely be moved towards each other by means of a first movement (MI), whereby the two floor panels (2) are staggered in respect to each other, after which

these floor panels (2), by means of a second movement (M2), substantially transverse to the first, can be brought behind one another with their coupling parts (9-10) and with said guide-forming portions (24-25).

18. -Floor panel according to any of the claims 8 to 17,</RTI>

<Desc/Clms Page number 30>

characterized in that said edges (5-6) have guide-forming portions (24-25) having such a course that in the second condition (C2) a fit-forming cooperation between the respective floor panels (2) is obtained, such at two or more locations distributed over the length of the cooperating edges (5-6) or continuously over the major part of the length of these cooperating edges (5-6).

19. -Floor panel according to any of the claims 8 to 18, characterized in that the two opposite edges (5-6) at which the integrated means (23) are provided are configured such that, when two of such floor panels (2) are presented to each other with these edges (5-6), those, in at least one mutual position of the two floor panels (2), can be brought with their guide-forming portions (24-25) behind one another, by means of a mutual movement perpendicular or substantially perpendicular to the plane of the floor panels (2), more particularly by means of a so-called "drop-in"movement.

20. -Floor panel according to any of the claims 8 to 19, characterized in that the two opposite edges (5-6) at which the integrated means (23) are provided, show portions (31- 32) which, when two of such floor panels (2) are presented in one and the same plane with these edges (5-6) opposite each other, fit freely over one another by a shifting movement towards each other, however, with a subsequent shifting movement in the longitudinal direction of the edges (5-6) engage behind each other.

21. -Floor panel according to any of the preceding claims, characterized in that said integrated means (23), as well as the coupling parts (9-10) of the edges (5-6) at which these integrated means (23) are provided, are made in one

piece of the material of which at least the edge portion of the actual floor panel (2) is realized.

22. -Floor panel according to claim 21, characterized in that the floor panel (2), at least at the location of the edge portion, comprises a base plate on the basis of MDF/HDF, out of which said coupling parts (7-8,9-10) and said integrated means (23) are realized. <RTI

23. -Floor panel according to any of the preceding claims, characterized in that the coupling parts (9-10), at the edges (5-6) which are provided with said integrated means (23), are configured such that they allow to couple two of such floor panels (2) at those edges (5-6) to each other by shifting them laterally in a substantially flat manner towards each other and/or by joining them by means of a mutual turning movement. <RTI

24. -Floor panel according to claims 3 and 23, characterized in that the coupling parts (7-8) of the first pair of opposite edges (3-4) are configured such that they allow to couple two of such floor panels (2) at these edges (5-6) to each other by shifting them laterally in a substantially flat manner towards each other and/or by joining them by means of a mutual turning movement. <RTI

25. -Floor panel according to any of the preceding claims, characterized in that said integrated means (23) comprise at least guide-forming portions (37-37A), more particularly a rounding, inclination or such, which allow that two of such floor panels (2), when being shifted into each other laterally, substantially according to the longitudinal direction of the respective edges, initially are brought from a first condition into a subsequent condition, whereby

<Desc/Clms Page number 32>

the floor panels (2) in said subsequent condition are coupled more tightly and/or closer together than in the first condition. <RTI

26. -Floor covering, characterized in that it is composed</RTI> of floor panels (2) according to any of the claims 1 to 25.

27. -Method for placing floor panels (2) in order to mutually couple floor panels (2) according to any of the claims 1 to 25, characterized in that this method comprises at least the steps consisting in that a first floor panel (2) and a second floor panel (2), at their edges (5-6), which are provided with integrated means (23), as aforementioned, are presented to each other in a mutually staggered position and that the floor panels (2) are mutually shifted, such that, as a consequence of this shifting movement (T), the floor panels (2) are brought from the first condition (CI) into the second condition (C2).

28. -Method according to claim 27, characterized in that use is made of floor panels (2A-2B-2C) which are rectangular and which comprise coupling parts (7-8,9-10) at all four sides, said coupling parts effecting a locking in vertical and horizontal directions, and that the floor panels (2A-2B-2C) are coupled to each other in a plurality of rows, whereby, when said first floor panel (2B) is already coupled to a preceding row, at least the following two steps are realized when placing the second floor panel (2C): <RTI - a first step in which the second floor panel (2C) is coupled to the first floor panel (2B), and possibly is moved further, such that it takes a position in which it is situated at a distance from

<Desc/Clms Page number 33>

the edge of the already placed row of floor panels (2A);a second step in which the second floor panel (2C), in the same or substantially the same plane as the first floor panel (2B), is shifted to the edge of the already placed row of floor panels (2A), whereby, on one hand, a coupling is realized between the second floor panel (2C) and the floor panels (2A) from the preceding row, as, on the other hand, by the intermediary of said integrated means (23) in the coupling between the second floor panel (2C) and the first floor panel (2B), a transition takes place from said first condition(CI) to said second condition (C2).

29. -Method according to claim 28, characterized in that</RTI> the second floor panel (2C) is coupled to the edge (4) of the already placed row of floor panels (2A) by shifting it to said edge (4) in the same plane as that of the first floor panel (2B), such whilst this first floor panel (2B) is in an angled condition in respect to the already placed row of floor panels (2A), whereby the second floor panel (2C) is angled down together with the first floor panel (2B), after the second floor panel (2C) has been aligned with the first floor panel (2B).

30. -Method for manufacturing floor panels (2) according to any of the claims 1 to 25, characterized in that at least the coupling parts (9-10) at the edges (5-6) at which said integrated means (23) are formed, as well as those integrated means (23), are formed of the material of which the floor panels (2) consist, by means of a machining process, more particularly a milling process, whereby the integrated means (23) are realized in the form of guide-

forming portions (24-25), whereby at least these guide- forming portions (24-25) are realized by displacing the respective floor panel (2) and at least one machining tool mutually along each other, such that the machining tool and the floor panel (2) perform a mutual displacement, the direction of which, at least for a part of the performed path, at least deviates from the direction of the actually pertaining edge (26-27) of the floor panel (2).

31. -Method according to claim 30, characterized in that the machining tool, during the formation of the guide- forming portions (24-25), is situated at a fixed location and that the guide-forming portions (24-25) are formed by directing the floor panels (2) according to a straight movement along the machining tool, with each floor panel (2) in a position in which the actual edge (26-27) at which such guide-forming portion (24-25) must be formed, is at an angle to said direction of movement. <RTI

32. -Method according to claim 30, characterized in that the guide-forming portions (24-25) are realized by displacing the respective floor panel (2) and at least one machining tool mutually along each other, whereas also laterally a mutual displacement <RTI (Z1-Z2) between the floor panel (2) and the machining tool is realized.
